IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of: Futoshi Tanigawa et al.			
Conf. No.:	2369	Group Art Unit:	1745
Appln. No.:	10/081,087	Examiner:	Dah Wei Yuan
Filing Date:	February 22, 2002	Attorney Docket No.:	10059-406US (P27064-01)

Title: POSITIVE ELECTRODE ACTIVE MATERIAL FOR ALKALINE STORAGE BATTERY, POSITIVE ELECTRODE USING THE SAME AND METHOD OF PRODUCING THE SAME

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Applicants request review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a Notice of Appeal.

The review is requested for the reason(s) stated on the attached five sheets (pages 2-6).

Respectfully submitted,

FUTOSHI TANIGAWA et al.

April 11, 2006 (Date)   By: Sandra M. Katz

SANDRA M. KATZ
Registration No. 51,864
AKIN GUMP STRAUSS HAUER & FELD LLP
One Commerce Square
2005 Market Street, Suite 2200
Philadelphia, PA 19103-7013
Telephone: 215-965-1200
Direct Dial: 215-965-1344
Facsimile: 215-965-1210
E-Mail: skatz@akingump.com

The Examiner has finally rejected claims 1-4 and 6-8 under 35 U.S.C. § 102(e) as being anticipated by or under 35 U.S.C. § 103(a) as being obvious over each of U.S. Patents Nos. 6,358,648 of Hayashi et al. ("Hayashi") and 6,083,642 of Kato et al. ("Kato"). Applicants submit that these rejections are clearly improper based on errors in facts and omissions of essential elements required to establish an anticipation or *prima facie* obviousness rejection, as set forth below.

The Examiner Has Ignored the Differences Between the Chemistry and Manufacturing Procedures of Hayashi and the Present Invention

1. The presently claimed invention relates to a positive electrode active material containing a nickel hydroxide and/or a nickel oxyhydroxide powder, in which the positive electrode active material exhibits specific physical properties, and a method of making the positive electrode. The positive electrode active material has a mean particle circularity of greater than 0.95 to less than 1, as determined by a particle image analysis with a flat sheath flow utilizing hydrodynamics, and the number of particles having a circularity of not larger than 0.85 accounts for not more than 5% of the total number of particles within the positive electrode active material.

2. When preparing the claimed active materials, it is essential that the pH, stirring and temperature of the raw material solutions be adjusted and carefully controlled (Request for Reconsideration filed November 15, 2004, pp. 4-5). Controlling circularity provides a positive electrode material paste which exhibits stable properties, and the amounts of dispersion medium, thickener, etc. which must be added to the active material are reduced, resulting in an increased active material density in the electrode. Batteries having higher capacity and longer life cycle are also obtained (see Table 1, pp. 15-16 and 33 of application).

3. In the final Office Action dated January 18, 2006 (pp. 1-2), the Examiner argues that Hayashi teaches all of the attributes of the claimed positive electrode active material, either expressly or inherently, taking the position that since the claimed and Hayashi positive electrode active materials have similar chemistry and manufacturing procedures, their properties would inherently be the same. The Examiner also asserts (p.2) that Hayashi has identified pH and the mixing degree of the solution as processing variables in the production of the positive electrode active material and that it would have been obvious to adjust such parameters to yield nickel hydroxide powders with desired circularity and distribution thereof.

4. To the contrary, the chemistry and manufacturing procedures of Hayashi are not the same as in the present invention. In col. 3, lines 27-41, Hayashi describes the synthesis of nickel hydroxide via reaction of an aqueous nickel sulfate solution with an alkali. Once the nickel hydroxide has been formed, the remaining sulfate ion is removed by treatment with an aqueous alkaline solution. Hayashi teaches that "the degree or extent of removal of the sulfate ion can be controlled by adjusting the pH of the aqueous alkaline solution used, and the duration and times of alkali treatment." Hayashi thus does not teach or suggest that the pH of the reaction solution used to <u>produce</u> nickel hydroxide is adjusted, as in the present invention. Rather, the pH adjustment of Hayashi occurs <u>after</u> the nickel hydroxide has been formed.

5. Further, in Example 1, Hayashi teaches that, "nickel hydroxide used in this example was produced by mixing and stirring an aqueous nickel sulfate solution and an aqueous sodium hydroxide solution thereby depositing nickel hydroxide" (col. 4, lines 33-36). In this example, nickel hydroxide materials were treated with aqueous sodium hydroxide solutions having different pH values to remove anions. However, there is no teaching or suggestion that the mixing is a processing variable which was varied or optimized in any way, merely a teaching that the nickel sulfate and sodium hydroxide solutions were mixed and stirred to form nickel hydroxide.

6. Finally, there is no teaching or suggestion in Hayashi of controlling the temperature of the raw material active solution, and the temperature thus depends solely on ambient temperature, which varies by such factors as location, the time of day and month of the year. These variations lead to variation in circularity of the resulting active material particles. Accordingly, Hayashi has not identified pH, degree of mixing/stirring, or temperature as critical processing parameters in the production of nickel hydroxide and thus <u>the manufacturing procedures of Hayashi are different than in the present invention</u>.

<u>The Examiner Has Ignored the Differences Between the Chemistry and Manufacturing Procedures of Kato and the Present Invention</u>

7. In the final Office Action (pp. 3-4), the Examiner also argues that Kato teaches the claimed positive electrode active material and attributes thereof. The Examiner maintains (pp. 4-5) that Kato has repeatedly identified pH and temperature of the solution as critical processing variables in the production of nickel hydroxide particles. In particular, the Examiner notes that the present disclosure (pages 23-24) describes adding an aqueous solution of nickel sulfate and ammonium sulfate into a solution of sodium hydroxide at 35°C and pH of 12. The Examiner also

refers to Example 2 of Kato as teaching that nickel hydroxide particles were charged in an aqueous cobalt sulfate solution and an aqueous sodium hydroxide solution was added dropwise with stirring while adjusting the pH at 35°C to pH 12. The Examiner concludes that since both disclosures teach the use of the same temperature and solution pH in preparation of the powders, they teach the same chemistry and manufacturing procedures.

8. Kato indeed teaches pH and temperature of the solution to be important. However, these parameters are taught to be critical in the production of cobalt hydroxide serving as a conductive agent, not in the production of nickel hydroxide, as in the present invention. Further, Example 2 of Kato referred to by the Examiner describes the preparation of $Co(OH)_2$-coated nickel hydroxide particles, and not the synthesis of the nickel hydroxide particles themselves. These particles were prepared in Example 1, which describes the addition of sodium hydroxide to an aqueous solution of nickel sulfate, cobalt sulfate, and zinc sulfate while adjusting the pH with aqueous ammonia. However, Kato does not disclose any detailed reaction conditions in the production method of nickel hydroxide, such as the temperature or appropriate pH, nor does Kato suggest that such parameters are critical to the production method, despite the Examiner's contention to the contrary. Therefore, Kato does not teach the criticality of temperature and pH in the production of nickel hydroxide, and thus the chemistry and manufacturing procedures of Kato are different than in the present invention.

The Prior Art Active Materials Would Not Inherently Exhibit the Claimed Properties

9. The claimed mean particle circularity and distribution thereof of nickel hydroxide are critical to providing the effects of the presently claimed invention, but are *only* achieved by varying the pH, temperature, and stirring of the raw material solution, as described above. The Examiner states:

> A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities.

Necessity is thus the standard required for establishing a case of inherency, and the Examiner has the burden of providing evidence that the element at issue necessarily flows from the prior art reference. He cannot merely assume such information without supporting evidence.

10. Here, the Examiner bases his conclusion on the assertion that the chemistry and manufacturing procedures of Hayashi and Kato are the same as in the present invention. To the

contrary, since Hayashi and Kato do not teach the adjustment of pH, mixing, and temperature as in the present invention (see ¶¶ 6,8 above), the prior art manufacturing procedures are not the same as in the present invention, and the claimed properties would not necessarily have been present in the Hayashi and Kato materials. Accordingly, the Examiner has failed to establish a *prima facie* case of inherency in support of the anticipation rejections.

There Would Have Been No Motivation Based on Hayashi or Kato to Adjust the Reaction Conditions to Arrive at the Claimed Material

11. The Examiner contends that it would have been obvious to adjust the pH, temperature and stirring in the Kato or Hayashi methods to arrive at the desired and claimed particle circularity and distribution. To the contrary, Hayashi and Kato do not recognize the parameters which needed optimization, particle circularity and circularity distribution, nor the profound effects such parameters would have on the resulting battery properties (see ¶¶ 12-15 below). Therefore, one skilled in the art would not have been motivated to adjust the reaction conditions of the prior art in order to arrive at the claimed positive electrode active material. Rather, such an assumption made by the Examiner is merely hindsight from the present invention, and the Examiner has not demonstrated any motivation to modify the prior art to arrive at the claimed invention.

The Claimed Particle Circularity and Circularity Distribution of the Active Material Are Unique and Provide Unexpected Properties

12. According to the presently claimed invention, the claimed active material has a mean particle circularity greater than 0.95, and the number of particles having a circularity of 0.85 or less accounts for not more than 5% of the total number. These features provide unique and unexpected results, as can be seen from Table 1 and Fig. 5 of the application.

13. For example, comparing Example 1 (mean particle circularity 0.95, number of particles having a circularity of 0.85 or less is 10%) with Example 2 (mean particle circularity 0.96, number of particles having a circularity of 0.85 or less is 5%), the battery of Example 2 exhibits a 48mAh increase in battery capacity and a 3% improvement in capacity retention rate. These differences in characteristics are attributed to the fact that the mean particle circularity is greater than 0.95 in Example 2, and the particles having circularity less than 0.85 is 5%.

14. When the mean particle circularity is 0.95 or less, the ratio of particles having a small circularity is larger than that of Example 2. Thus, when the mean particle circularity is 0.95 or less, reducing the number of particles having a circularity of 0.85 or less has no effect on the

characteristics. It is only when the mean particle circularity is increased to greater than 0.95 and the number of particles having a circularity of 0.85 of less is controlled, that the improvements in characteristics can be achieved. In other words, the combination of the claimed mean circularity and circularity distribution produces the excellent and unexpected effects of the present invention.

15. These effects and unexpected results have been previously described (see Amendment filed July 11, 2005, pages 7-8). In the production of the battery of Comparative Example 1 (corresponding to prior art batteries), processing variables are not optimized and the temperatures of the raw material solutions are not adjusted when preparing the nickel hydroxide powder. In comparison, the batteries of Examples 2 and 3 according to the present invention exhibit improved battery capacity and thus meet the objective of the present invention (page 10, lines 3-12 of specification). The mean particle circularities and distributions of these batteries are shown in the Table below. It can be seen that the batteries of Examples 2 and 3 exhibited improvements in battery capacity of 4.6% and 6.3%, respectively, relative to the comparative battery.

	mean particle circularity	# of particles with circularity ≤ 0.85	battery capacity ($C_{0.4A}$)	increase in battery capacity relative to Comp. Ex. 1
Comp. Ex. 1	0.94	10%	2058 mAh	-------
Ex. 2	0.96	5%	2153 mAh	4.6%
Ex. 3	0.97	2.5%	2189 mAh	6.3%

16. In the mature field of nickel-metal hydride storage batteries, there is little room for improvement in battery capacity. Therefore, Applicants' method, which provides for an increase in battery capacity by as much as 6.3% by optimizing reaction conditions to adjust the shapes of the active material particles to particular circularities, is in fact unexpected and significant and would not be expected based on the prior art. These unexpected results would overcome any case of *prima facie* obviousness which were to be established.

Conclusion

In view of these remarks, it is respectfully submitted that the above errors of fact and omissions of essential elements to establish *prima facie* obviousness or anticipation render the outstanding rejections improper. Withdrawal of the rejections and a Notice of Allowance are respectfully requested.